

193. ALCOHOL.

Fermenting-

Apparatus-

Wats.

1892

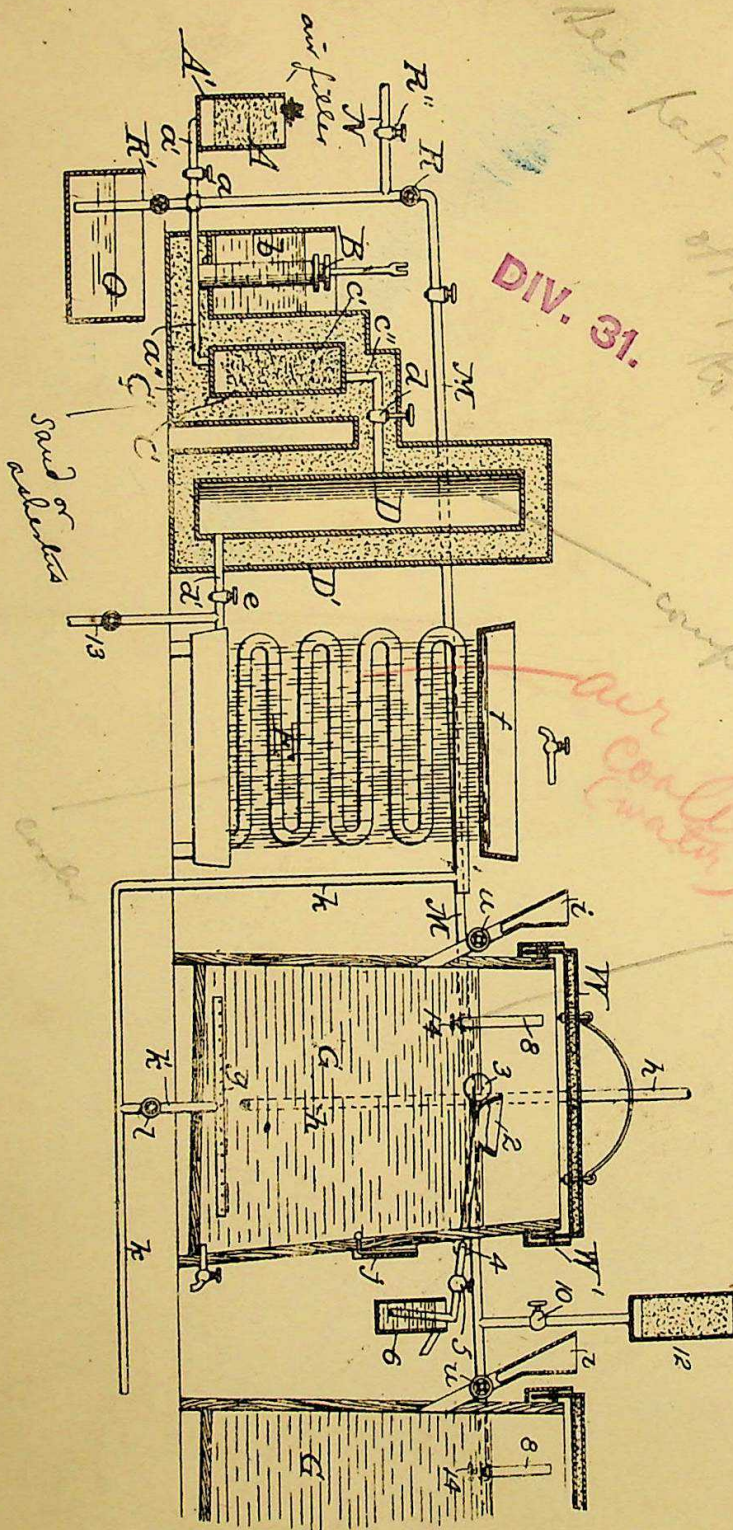
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THOMPSON'S COMPLETE SPECIFICATION.



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A.D. 1892

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## COMPLETE SPECIFICATION.

Improvements in the Method of and Apparatus for Manufacturing Beer, Ale, Wine, Cider, or the like.

A communication by CHARLES FRANCIS LAWTON, of Bronson Avenue, Rochester, in the County of Monroe, and State of New York, United States of America, Chemist.

I, WILLIAM PHILLIPS THOMPSON F.C.S., M.I.M.E. of the Agency for Foreign Patent Solicitors, 6 Lord Street, Liverpool and 6, Bank Street, Manchester, both in the County of Lancaster and 323 High Holborn in the County of Middlesex, Civil Engineer do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to an improved method of and apparatus for the manufacture of beer, ales, wines, *etcetera*, and consists in various features hereinafter set forth and claimed.

10 The object of the invention is the rapid fermentation of beer, ale and wine, under conditions that prevent the introduction and growth of deleterious ferments in the liquor while subject to the action of the proper yeast ferment.

The preferred form of apparatus for carrying out the process will now be described, reference being had to the accompanying drawings, in which—

15 A, indicates an air-filter comprising a metallic vessel A<sup>1</sup> filled with clean cotton. This filter A, stuffed with cotton, is for the purpose of removing dust, which, without it, would pass into the compressed air filter and there the dust, unless previously removed, would burn and thus give a bad odour to the air and a bad taste to the beer, treated with the air.

20 B indicates a pump communicating with the filter by a pipe a<sup>1</sup> having a valve a, and communicating also by means of a pipe a<sup>11</sup> with the bottom of a strong metallic vessel C which is filled with asbestos or sand, as at c<sup>1</sup>. A pipe c<sup>11</sup>, having a valve d, extends from the top of the vessel C to a vessel D, while from the vessel D extends a pipe d<sup>1</sup> having a valve e.

25 The vessel C is surrounded by a jacket C<sup>1</sup>, while the vessel D is surrounded by a similar jacket D<sup>1</sup>, the spaces between the vessels and the jackets being filled with any suitable non-conductor of heat. The pipes a<sup>11</sup> and c<sup>11</sup> are likewise jacketed so as to prevent the heated air or gas from being cooled.

The pipe d<sup>1</sup> extending from the lower end of the compressed-air reservoir D 30 communicates with a coil or manifold E, upon which water from a pan or receptacle f is designed to fall to cool the gas or air under pressure. This manifold or coil communicates with a pipe k extending along beneath the tuns or vats G G, while branch pipes k<sup>1</sup> having valves l extend from the pipe k up through the bottom of the tuns where they are provided with finely perforated arms g.

35 Besides being used for injecting compressed air into the fermenting tuns, the pipes k and k<sup>1</sup> and g and valves l can be used for drawing off the beer after the fermentation has been finished, or the beer can be drawn off by taps (not shown) at different levels in the side near the bottom of the tuns.

The tuns are provided with covers W having downwardly turned edges to dip 40 into a liquid in a trough W<sup>1</sup> secured to the tuns, as shown, the liquid being advisably combined with an antiseptic to, prevent any foreign ferments passing into the interior of the tuns.

These covers W are made double with the space between the two shells packed with asbestos, slag, wood or other non-conducting material. This is for the 45 purpose of allowing the lower or inside surface of the covers to become hot enough

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to destroy all noxious germs that may be sticking to their lower surface when the boiling hot wort is run into the tun. The covers are also provided with bails for the purpose of readily hoisting and handling them when they are removed for any purpose.

Tuns G are further provided with funnels *i* having valves *u*, by means of which the tuns may be filled; but, instead of the funnels, the vertical pipe *h* may be used for filling.

Opening into the tuns is a pipe 8 which communicates, at its outer end, with a pipe M extending along all of the tuns. This pipe M extends downward to the drip receiver or reservoir O, and intersects the pipe *a'*, and is provided on each side of the pipe *a'* with valves R R<sup>1</sup>.

The water in the reservoir O should be kept deep enough to form an efficient trap to prevent entrance of unpurified air into the pipe M, and the water in this reservoir O can be charged with some soluble antiseptic to keep it from getting foul. Another air trap (not shown) is placed at the other end of the long pipe M. The water in this second trap is made rather shallow to prevent the water in the circular channels around the tops of the tanks from being blown out when the tanks are being charged with air.

When it is desired to compress and force into the wort a gas different from common air, the valves *a* and R will be closed, and the valves R<sup>11</sup> on the pipe N opened. This branch pipe N, whose whole length is not shown, communicates with the holder containing the gas that is to be pumped into the fermenting wort.

The long horizontal pipes M and *k* are inclined enough to allow all water that may condense or otherwise get into them to run off into air traps, one of which is shown at O. The air trap for the pipe *k*, however, is not shown in the drawing. Before being used in connection with a brew, the pipe M and manifold E and pipe K are purified by injecting through their entire length scalding hot steam or some antiseptic vapour, such as sulphur dioxide or a small quantity of ether or chloroform or ethylic or methylic aldehyde. These antiseptic vapours for purifying the insides of the pipes may be injected through the branch pipes and valves N R<sup>11</sup> and 13.

Surrounding the air and gas pump B is a tank *b*, which may be partly filled with water when the pump is being rapidly worked at a high pressure. This water prevents the lower part of the barrel of the pump and the piston inside of it from heating to such a degree as to cause cutting of the working parts. As the compressed air passes so quickly out of the pump, this cooling of the outside of the barrel of the pump will not materially lower the temperature of the compressed air that is driven into the second air filter C and compressed air receiver D.

Should it be desired to aerate new hot wort recently let into one or several of the fermenting tuns, or should it be desired to aerate, cool and purify fermenting wort that has become unclean or sickened, or shows signs of becoming so, then the valves R R<sup>1</sup> and R<sup>11</sup> are closed, the valve *a* opened, the valve *e* shut or but slightly opened, and the pump set in action.

The accumulation of compressed air in the filter C and receiver D rapidly heats it, together with the walls of the containing vessels, surrounded as they are by non-conductors, to such temperature as to destroy noxious ferment germs. The first of the air that is run through the manifold E and pipe *k* from the compressed air receiver D is allowed to escape without being run into the wort, as usual. This is to get rid of stagnant air that may have lain in the manifold E or pipe *k*.

The compressed air filter C being packed with asbestos or fine sand, the heat evolved by the compression does not char or set fire to it as it would if the filter C was packed with cotton like the filter A, which is not subjected to compressed air.

The valve *e* (leading from the compressed air receiver D to the manifold E) having but a small opening when used with compressed air, prevents any back circulation into receiver D of cooled or compressed air in manifold E or pipe *k*. Without covering the compressed air filter C and compressed air reservoir D with a thick coat of non-heat conducting material, the compression of the air in



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these vessels would not heat it sufficiently to properly sterilise it. When everything is ready for the use of the compressed and sterilised air, the valves *l* of one or more of the fermenting tuns are very slightly opened, and the air escaping through this valve up into the wort expands, and, consequently, absorbs heat while  
5 in the immediate presence of the beer or wort to be cooled and aerated.

By this means, the refrigerating effect of the compressed air is obtained with the greatest possible economy of power and plant, and aëration is obtained simultaneously with cooling, which is of considerable advantage, as cold air is more freely absorbed by watery liquids than warm air is.

10 The previously strained hot wort is run from the vessel, where it has been boiled down with the hops, by a flexible pipe or hose, to the funnel *i*, through which it enters the tun. As soon as the tun is filled to the proper height, the stream of boiling wort is shut off, and the valve *u* in the funnel closed. The hot wort is left in the tun until the heat it carries has killed the injurious ferments,  
15 such as might adhere to the inside of the tun and its cover, and such germs as might be on or in the pipes *g* and *h*.

This large body of heated wort will remain very hot for a long time, but, after it has stood long enough to kill the germs of injurious ferments, the strongly compressed air properly cooled air from the pipe *k* is let up into the tun through  
20 the slightly opened valve *l* and perforated pipe *g*, as above described, and quickly lowers the temperature of the wort to the point desired, the temperature being indicated by the thermometer *j*. As in the operation of boiling down, the wort loses its dissolved air necessary to the most vigorous action of the proper yeast fermentation, this process not only cools, but, as before stated, properly aerates  
25 the liquor without introducing ferments that would spoil it. Besides the usual methods of cooling hot wort, it is exposed to all the contaminating influence of ordinary unpurified air.

Besides sustaining the proper yeast ferment, the aëration of the beer with purified or sterilised air kills that most dangerous and troublesome of all sickness in  
30 beer and ale, known as the butyric, as Mr. Lawton has learned by many experiments.

After the tun has been filled with hot wort, the valve *u* of the funnel *i* is closed and the funnel is filled with boiling hot water, but, after the wort is cooled sufficiently to admit of the yeast being added, the valve *u* is opened and the water  
35 that was standing in the funnel allowed to run into the tun and then the liquid yeast, as pure as may be obtained, is run into the cooled wort through the same funnel.

The yeast can now be stirred or mixed up with the wort by injecting a little more air into the bottom of the tun.

40 Air and gas passing from the tun escape by means of the branch or U-pipe 8 into the pipe *M*.

The pump may be worked at a pressure of from 120 to 170 pounds (more or less) which will raise the temperature of the air thus being compressed to 400° Fahrenheit and upwards.

45 Some brewers prefer to ferment their wort without skimming off the barm, but, for those who would remove the barm as it rises, the automatic skimmer, represented at 2, 3, 4, 5, and 6, can be used.

At Figure 2 is the floating skimmer opening at its bottom into the nearly horizontal barm pipe. Rigidly attached to the skimmer is the hollow metallic  
50 float 3. The barm pipe passes into the box 4 with the open side of the box opening into the tun. A right or rounded angle turn is made in the pipe inside the box 4, and another right or rounded angle turn is made in the same pipe just outside the box and where the pipe passes through the side of the box, it is surrounded by a stuffing box packed with cotton and vaseline, to make it perfectly tight, and at the same  
55 time allow it to turn easily. Instead of these crooks in the barm pipe and the stuffing box, the pipe can be made straight and pass through a flexible rubber diaphragm in the side of the tun. At 5 is a weight with a set screw. This weight



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slides on the barm pipe outside the tun, and according as the position of the weight is fixed, the skimmer may be made to float with its rim at such an elevation above the wort as to skim close or only take off the top of the barm.

The outer end of the barm pipe is bent downward so as to dip into the vessel 6, the liquid in which serves as an air trap to prevent outside air entering the tank 5 through the barm pipe.

All the metal parts of the apparatus that come into contact with the wort and beer are preferably made of heavily tinned copper or enamelled iron to prevent corrosion.

While air is being injected into the wort, and while the wort is in process of 10 fermentation, the valve 14 is kept open to allow escape of surplus air and carbonic acid, which is discharged through the pipe M, and out through the shallow air trap (not shown) at the end of the pipe.

To prevent unpurified air entering the pipe M or the top of the tuns being sucked in through the air trap when the temperature falls or the barometric pressure 15 rises, the cotton air filter 12 is provided, which will let in air very easily when it moves as slowly as it would when produced by fall of temperature or increase in barometric pressure.

In general, the outflow of carbonic acid from the fermenting wort would make the air filter 12 unnecessary, but there might be occasions when it would be useful. 20

Both carbonic acid and injected air escape from the inside of the top of the tun through the short upright pipe 8 into the long pipe M.

The foregoing description indicates the way of carrying the invention into effect in the process of manufacturing beer, but it is obvious that, once given the idea, the invention may also be applied to the manufacture of ale, wine, cider or other 25 fermented liquors, and is not limited to the manufacture of beer only.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, as communicated to me by my foreign correspondent, I declare that what I claim is:—

1. The improvement in the process of manufacturing beer, *etcetera*, which consists 30 in raising the temperature of a body of air by highly compressing it, and confining it in this condition until the sterilisation shall have been effected; and then cooling the air and injecting it into the wort, substantially as and for the purposes described.

2. In combination with a tun or vat, a compressed-air receiver D, an air-filter C 35 containing an incombustible filtering material, a pump B connected with the filter, a non-conducting jacket surrounding the filter and receiver, and pipes connecting the receiver with the vats and with the filter.

3. In combination with the tuns or vats G, a pump or compressor B, an air-filter C and a receiver D for the compressed air, a coil or manifold E, a water 40 supply *f*, and a pipe *k* leading from the coil to the vats, all substantially as shown.

4. In combination with an air pump or compressor B; an air filter A applied to the supply pipe thereof; an air-filter C applied to the discharge pipe of the pump; a compressed air receiver D, a cooling coil or manifold connected with the receiver, the tuns or vats, and suitable connecting pipes. 45

Dated this 15th day of February 1892.

WM. P. THOMPSON & Co.,  
Agents for the Applicant.